PROPOSED SURFACE WATER AND SEDIMENT SAMPLING STRATEGY (STEP 7: DEVELOP THE DETAILED PLAN FOR OBTAINING DATA)

For migration mechanisms from the sources of contamination to the surface water and sediment, please see the draft CSM diagram. For locations of the confluences, the ponds proposed for sampling, and locations where samples are proposed to characterize upstream conditions, please refer to the attached sketch. No upstream conditions will be evaluated for the short tributary to the northwest as it appears that its entire length may have been impacted by Lorraine Refinery activities.

Data for surface water and sediment samples will be used to inform the team as to what ecological receptors need to be targeted for sampling and at what locations. Conditions noted for the surface water bodies will also inform the risk assessors if a risk from acute or chronic exposure may be applicable.

Notes are included regarding other media characterization and sampling results that will be necessary in the complete evaluation of the pathways related to the surface water and sediment media.

This text constitutes STEP 7, Develop the Detailed Plan for Obtaining Data, of the data quality objectives (DQOs) proposed for the surface water and sediment media. The strategy to be applied to select the sample locations for the surface water/sediment exposure media is presented in the following paragraphs. The number and type of samples to be collected are presented for each location.

1. Along each stream/tributary, the sample locations will be selected at relatively regular intervals of approximately 200 ft at locations where deposition and accumulation of contaminants may take place. Sand Creek and East Tributary and West Tributary are meandering streams; therefore, deposition and contaminant accumulation is anticipated within the point bar portion of the stream bed. For this reason, the sand bars are the locations where samples are proposed to be collected.
    - Surface water samples will be collected from each location at a depth of 0.0-1.0 ft below the water surface or shallower.
    - Sediment samples will be collected from each location from 0.0 to 1.0 ft below ground surface (bgs).
    - Estimated 60 locations: 60 surface water samples and 60 sediment samples
    - Locations are not shown on attached map.
2. At the confluences of streams:
    - Same sampling depths as described under Item 1
    - Three locations: 3 surface water samples and 3 sediment samples
    - See attached map for locations of Confluences 1, 2, and 3.
3. At locations where drainage from former potential sources of contamination (for example, where the three drainage features drain to Sand Creek from Tank 34 location). Note that shallow soil samples (0.0 – 1.0 ft bgs) will be collected along the drainages leading from the former potential source of contamination to the surface water to characterize the soil along this path; details on the soil samples are accounted for under the surface soil investigation DQOs.
    - Same sampling depths as described under Item 1
    - Estimated 10 locations: 10 surface water samples and 10 sediment samples
    - Locations are not shown on attached map.
4. By the bridge at 8th Street, crossing Sand Creek:

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- For each location, surface water samples will be collected from a depth of 0.0-1.0 ft below the water surface or shallower.
- From each sampling location, sediment samples will be from three depth intervals: 0.0-1.0 ft bgs, 1.0-2.0 ft bgs, and 2.0-3.0 ft bgs.
- Estimated 5 sampling locations: to be determined in the field by the stakeholders based on former observations of a "black oily substance"
- Estimated 5 surface water samples and 15 sediment samples: 5 from 0.0-1.0 ft bgs, 5 from 1.0-2.0 ft bgs, and 5 from 2.0-3.0 ft bgs

5. At seep locations along Sand Creek, a sample of the seepage will be collected, if present. If a seep is identified by seeing a wet area on the sandstone above the water level, then a sample of surface water and sediment (if sediment is present) will be collected below the wet spot; in addition, a surface water/sediment pair will be collected from the nearest downstream location where a sand bar is present.
    - Grab samples for seeping water
    - For surface water and sediment, same sampling depths as described under Item 1
    - Estimated 10 locations: 10 grab seep samples (if water is seeping), 10 surface water samples, and 10 sediment samples
    - Locations are not shown on attached map and will be identified by sampling personnel in the field.
6. To obtain reference values and characterize upstream conditions of the flowing bodies of water, as follows:
    - Same sampling depths as described under Item 1
    - One location for Sand Creek (Upstream Condition 1)
    - One location for the West Tributary that crosses the site (Upstream Condition 3)
    - One location for the East Tributary, at discharge point from Pond P9 (Upstream Condition 2)
    - See map for locations of Upstream Condition Locations 1, 2, and 3 (proposed locations may be modified based on an in-depth review of the site map and field conditions)
7. From permanent ponds or ponds that are used for fishing, collect samples from 4 locations, and from temporary ponds or ponds that are not used for fishing, collect samples from 2 locations; locations will be situated along the periphery of each pond. If a pond is situated along a stream (such as P1 and P7), one sample location will be situated at the entry point into the pond and one at the discharge point out of the pond. Inquiries will made with residents about the presence of fish in the permanent ponds, as well as if any of the temporary ponds are stocked with fish.
    - Same sampling depths as described under Item 1
    - Six ponds are currently identified on the map within the site boundary and one pond (P7) is located along East Tributary, downstream from potential sources of contamination; for planning purposes, 2 of these 7 ponds, P1 and P7, are assumed to hold fish (each with 4 sampling locations).
    - Estimated 18 sample locations: 18 surface water samples and 18 sediment samples
    - Locations are not shown on attached map.
8. To obtain reference/background conditions for ponds, 4 sampling locations are proposed from Pond P8, located east of the site; because of its location on the other side of the East Tributary, this pond is not considered to have been impacted by site activities.

- Same sampling depths as described under Item 1
- Estimated 4 sample locations: 4 surface water samples and 4 sediment samples
- Locations are not shown on attached map.

Samples will be collected from each location, as follows:

- Collocated surface water/sediment pairs will be collected from each location, unless otherwise specified above.
- All sediment samples will be collected from 0.0-1.0 ft bgs, except as described for the samples to be collected by the 8th Street bridge.
- All surface water samples will be collected from 0.0 to 1.0 ft or shallower below the water surface.
- All surface water and sediment samples will be collected from each location at the same time while moving upstream from the confluences as follows: (1) Sand Creek and the East Tributary starting from Confluence 1, (2) West Tributary starting from Confluence 2, and (3) the short intermittent stream in the northwest corner starting from Confluence 3. This manner of sampling will ensure that the water and sediment at the upstream sampling locations are not disturbed due to collection activities ongoing downstream.
- Locations of the drainages from former potential sources of contamination will be identified during the initial mobilization or as agreed upon by stakeholders; surface soil and sediment samples will be collected from the points of confluence of the streams with these drainages; soil samples from the drainages are discussed under the soil DQOs.
- Locations of seeps will be identified in the field, based on the conditions at the time of sampling.

It is anticipated that, depending on the time of year, some ponds/intermittent streams such as the West Tributary and the northwest tributary may not contain surface water. If completely dry, only the sediment sample(s) will be collected as per the strategy outlined above. If the bodies of water are dry, the sediment samples collected will also be also evaluated for exposure as surface soil exposure medium (see DQOs for surface soil for the decision process). If there is water ponding in the intermittent streams, collocated ponded water and sediment will be collected from available locations, but at a frequency of not more than 1 sample every 200 ft.

In order to be able to assess the appropriate exposure routes and receptors for each surface water body, sampling personnel will make a sufficiently detailed description of the vegetation surrounding the site, and will note if there are any animals present or any traces of animal life. Based on these observations and information collected from the residents on how the surface water bodies are used (fishing, swimming, etc.), risk screening (and if screening criteria are exceeded, risk assessment) of a threat to the appropriate human and ecological receptors will be evaluated. The results for surface water and sediment samples will be also used to determine where biota samples will be collected (most likely, from the most contaminated locations).

Wetlands: the Hazard Ranking System report notes the presence of wetlands associated with the site. The presence of the wetlands will be first confirmed per the protocol described below. If wetlands are identified, then this sensitive environment will be included in the CSM and additional characterization and sampling may be required. The protocol is described below.

1. Obtain available Natural Resource Conservation Service (NRCS) soil surveys, infrared and true color aerial imagery, National Wetland Inventory (NWI) data. Based on this data, preliminarily identify locations with hydric soil and potential hydric soil, areas identified as wetlands by NWI, and possible wetland signatures on infrared imagery.
2. Ground-truth wetland extents in accordance with the United States Army Corps of Engineers wetland delineation manual and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0), March 2010. Wetlands will be delineated based on three (3) criteria:
    a. Indicators of hydrology
    b. Dominant hydrophytic vegetation in the appropriate stratum, and
    c. The presence of hydric soil.

    Delineation will be performed by walking along the wetland-upland interface and continually identifying the interface where these three criteria are met and not met. At each point where the line changes direction the interface will be marked with colored surveyor flagging tape and pin flags as appropriate. Additionally flags and tape will also be set in a way as to capture the wetland areas and so that each flagged location is visible from the next flag on each line in both directions. A wetland determination data form (Great Plains Region) will be populated at each location where the vegetative community or soil type changes along the wetland delineation. Each flag will be marked with a discrete identification number. Vegetative community boundaries will be identified, sketched, and recorded. Wetland community boundaries that border each other will be approximated and not delineated.
3. A global positioning system (GPS) unit shall be used to capture the flag locations. The GPS unit will be capable of locating each flag to within 15 feet of the actual location in the most densely vegetated areas.